



Educational Agro- Industrial Cluster as an Efficient Form for Advanced Multilevel Agricultural Education Aimed at Innovative Agrarian Practices

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Abstract

The article considers a new model of professional agricultural education for developing learners' innovative potential within a multilevel education system. Before developing this new model we made a thorough cultural-historical analysis of educational concepts underlying educational activities of a German classical university (the paradigm of autonomy) and an American university (a heteronomous paradigm). The research allowed to determine the methodological approach to the development of an educational agricultural cluster. It was done by active participation of Tomsk Agricultural Institute. The study of the problem allows us together with agribusiness, institutions of secondary vocational education, and rural comprehensive secondary schools to propose a range of integration measures. All above mentioned institutions also took an active part in the formation of the educational agro-industrial cluster. We then determined the strategy of the cluster development and specified the functions of Tomsk Agricultural Institute to coordinate the work of all structural departments responsible for professional training of specialists interested in innovative activities in the agricultural sector.

Keywords: educational paradigms, proactive advanced training, agricultural IT-school, institutions of secondary vocational education, agricultural institute of higher education, innovative agricultural plant, integration, innovative potential of learners

1 Introduction

The State program for Agricultural Development and Regulation of Agricultural Products, Commodities and Food Markets approved by decision N717 from 14th of July 2012 of the Government of the Russian Federation determines the strategic aims of the Ministry of Agriculture of the Russian Federation over a period of 2019-2024. The strategic aims of the state programme are to:

- ensure food security of the Russian Federation taking into account economic and territorial accessibility for the production of an agro-industrial complex;
- expand the capacity of agricultural export.

Numerous scientific studies concerned with the development of agricultural production in the Russian Federation and the analysis of regional agricultural activity in Tomsk Region demonstrate the possibility to reach strategic aims only by active implementation of innovative strategies. It is necessary to emphasize that innovative development of the farming industry in a region can be achieved only by the priority development of the innovative potential of people involved in agriculture. Therefore, the foundation of educational systems majoring in agriculture and aimed at training learners who are inspired by innovative activities is very urgent. This requires the creation of new conditions and the development of new educational technologies ensuring 'growing' learners whose motivation to innovative activities is dominating (17, 5, 13). Traditional educational systems including agricultural training are too conservative. On the one hand conservatism is quite positive quality since it demonstrates concern for people and care for their future (26,

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20). On the other hand conservatism hinders training students with unique abilities and progressive ideas able to compete on the fast changing labour market, make decisions under pressure and act independently (6). Therefore, one of the main tasks is to determine the methodological approach to agricultural professional training to affect learners' development and help them to become increasingly skillful, consistent, and committed in their use of an innovation in agriculture.

2 Methodology

To solve the problem with the vocational training of specialists focused on innovative agrarian practices, we carried out a cultural and historical analysis of educational concepts. After thorough analysis of the existing concepts, we determined two major features of educational vocational institutions and came up to the conclusion that two educational paradigms correspond to them.

The first paradigm is known as "**autonomous education**". German university designed and created on the basis of H. Wolf's ideas is a classic example of the implementation and realization of this conceptual scheme. Learners, according to the idea of this paradigm, should be isolated and separated from modern life. All their attention should be paid to the accumulation of educational traditions and the development of historical perspectives through the development of skills necessary for comparison person's ideas with gained ideas and then formulate the most common universal way of thinking and understanding (1).

The second paradigm is known as "**heteronomy of education**". According to this conceptual scheme, education is developed to satisfy needs and interests of different fields including agriculture. American university is the example of this paradigm implementation and reflects J. Dewey's ideas that each university is established to train smart, intelligent and critically thinking specialists able to work in different fields of science, technology, industrial production, agriculture and etc. (7).

Leading educational vocational institutions follow both paradigms. It means that by establishing an agrarian educational institution aimed at innovative agricultural practices it is necessary to use both paradigms and training should be autonomous and heteronomous. The agrarian vocational education should, therefore, be autonomous and independent of the current, momentary state of things in agriculture. On the other hand it should be dependent on the current reality in the agricultural sector and specialists must be able to take some certain steps for innovative development of the agriculture in the region.

3 Results and Discussion

Research on innovative changes in the agricultural sector in Tomsk Region has shown that the main constraint to achieve set objectives is in the deficiency of competent rural workers, professional agrarians and their low mobility at all levels of work organization.

This social phenomenon is caused by low workforce activity, poor work organization with the right distribution and coordination of work tasks and low efficiency of the majority of institutions dealing with the agricultural sector.

First of all there is a lack of correspondence between the goals and objectives of scientific educational practice, innovative development of agricultural production and rural areas.

One of the most efficient innovative ways to develop the agricultural sector of Tomsk Region is to unite efforts of agricultural business, state, agricultural scientific and educational community and to use them for rapid implementation of modern agricultural technologies.

At present our specialists are able not only to use the activity-related potential but also "to chip off" some certain forms of activity for carrying out their technification. We can say that purposeful artificial work with this activity has been mastered at the level of a social system as well as at the level of a certain region. This creates favorable conditions for transferring any activity including agricultural and transforming the provincial stagnation into a certain cultural level through man's ability to spiritual self-determination.

To be successful in the purposeful artificial "implantation" of controversial complexes of activities and realize the expected benefits of innovations it is necessary to choose new forms and ways of thinking *and develop new ways and forms to get acts of thinking and activities together* (7). There is a new tendency when specialists involved in development of educational systems aimed at getting acts of thinking and activities together appeal to the cluster approach. This allows ensuring systemic development of its components including "education", "technology, and "production". Cluster approach to agricultural professional education can be used as the basis for preparing learners to innovative activity in agriculture and developing new projects. Environmental approach is also very important for vocational training and collaboration between specialists and employers (7, 4, 14).

The experimental educational platform founded by Tomsk Agricultural Institute and limited liability company "Siberian milk" in Yagodny (a residential settlement in Asynovsky district) is used to gain some experience of tackling problems with agricultural vocational training. Cluster approach was chosen as leading. There is everything for the development of students' innovative potential. There are several interactive classrooms and four laboratories on two floors. These laboratories deal with the artificial insemination of cattle, research of microclimate, estimation and analysis of fodder and milk quality. All rooms are equipped with systems of videoconferencing, laptops, board monitors and video cameras used to demonstrate all the processes at the cattle farm in the real-time mode (feeding, cleaning, robotic milking, artificial insemination and etc.). Students master their primary skills of milking and diagnosis of diseases on a special trainer-simulator made by Lely and De Laval. VR-headsets that are at learners' disposal in the computer-assisted instruction center allow them to "visit" the best farms in the world. We managed to integrate educational and industrial processes. It is necessary to emphasize that this integrated education system unlike the traditional one is focused mainly on learners' needs in a real production environment. The educational environment of the integrated education opens new horizons to learners' cooperation and interaction with a full range of objects on the

basis of didactic principle “learn when working” and enables them to enhance their knowledge through activity (search, research, simulation, design and etc.) (Psychological and pedagogical support, 2007, 19). Practice-oriented learning within this integrated model allows learners to take the extended learning environment not only as the place for getting education and developing their professional career but also as the environment for their life activity and problem solution (11, 8).

The first outcomes at the experimental educational platform of Tomsk Agricultural Institute have confirmed the efficiency of the developed educational model (improvement in the quality of skills, increase in practical experience and etc.). On the other hand, it has shown a lack of learners’ readiness to new forms of communication and teamwork with the participants of different ages. Learners are also not fully ready to take responsibility; they do not always demonstrate their leadership qualities and don’t often have a clear idea of a country lifestyle.

The conclusion made above and the results of observation call for a clear need for increasing the number and membership of participants taking part in the experiment. There is an idea to include some agricultural colleges and agrarian special purpose classes in the structure of educational and industrial agrarian clusters.

Agricultural institutions of secondary vocational education are “forgeries” for training personnel for the agrarian sector. Some experts claim that our vocational institutions are too determined by the main vocational educational program and they do not always ensure the required practical experience. That is why the process of adaptation of graduating students to the country lifestyle and industrial environment is not very smooth. The contradiction between the determined system of vocational training and stochastic nature of the agrarian production environment is one of the reasons for difficulties in adaptation. There is a necessity to make the process of vocational training in the system of secondary vocational education more open to the external environment for better learners’ identification with their agricultural specialty and country lifestyle through the prism of internalization of different institutions like *college - agricultural industry-village area* (12, 18, 23).

The current agro-industrial complex of Tomsk Region suffers from a lack of agrarian specialists with university degree able to analyze, predict and simulate the processes of agricultural production ensuring food security of the Russian Federation and increasing the export potential on the innovative basis. Therefore there is a plan to open the department of *applied bachelor’s degree* program in the institutions of secondary vocational education that will enter into the structure of an educational and industrial cluster.

General and professional competences will be developed through a module-competence approach using innovative educational technologies, forms and training aids (4).

Tomsk Agricultural Institute has already begun to create a center of distance e-learning using such learning platforms as Moodle, Timvi, Emblaze-Vcon and etc. as its. The purpose of this center (together with colleges that enter into the structure of the agricultural educational and industrial cluster) is to fill up the missing gap in specialists’ training for

agricultural complex of Tomsk Region. E-learning on bachelors’ programs will be competitive since it has links with agricultural production and life activity of rural settlements. It will also allow young people with bachelor’s degree to get university education without leaving their families and places.

A special attention by training within the applied bachelor’s degree program should be paid to the development of the active stand in life because students involved in this training will take part in developing their own learning algorithm, be responsible for their own education and able to carry out their own search for knowledge and its acquirement (21). They also should be able to put their skills into practice. The transition to autonomous self-guided learning is one of the distinctive features of training specialists with higher agricultural education in the system of applied bachelor’s degree (10).

A foundation of an agrarian IT-school will help to solve the problem with lifelong agrarian education. An agrarian IT-school is a good idea for remote agricultural enterprises. The municipal transport network is as a rule underdeveloped in the majority of rural areas. Poor transport service and low logistics together with low material and financial income of citizens living near these remote agricultural enterprises make it difficult for learners (who live in the country and have a clear idea of a country lifestyle) to get to special educational resources (circles, studios, elective courses and etc.) (15).

Therefore children who live in villages do believe that the life that is on TV screen with a lot of goods and stylish people is not affordable for them. In spite of being very young they know about deprivation and poverty of rural population who suffer from social and cultural inequality. That is why so many village pupils dream of getting secondary education and want to live and work in the future anywhere else but not in the village.

What is the parents’ attitude to the desire of their children to migrate? The majority of village parents like millions of other parents are concerned with their own dreams that will come true through their own children. They hope that their daughters and sons will be more successful than they are. These dreams of a better life encourage parents to use all their energy for making their children move to towns and cities where the perspectives of career promotion are higher.

But in the desire of children’s career promotion the parents often forget that each ladder has ups and downs. There is no secret that the majority of children who leave their villages don’t become successful and don’t get an astonishing career promotion. There is a very good and well-known proverb “Dry bread at home is better than roast meat abroad” and there is a grain of truth in that.

How to stop, to slow down this spontaneous outflow of active and gifted young people who are able to change the current village lifestyle for better?

From our point of view one of the key reasons for this population migration is in the loss of rural traditions. Moreover such ignorant attitude to traditions is accompanied by village school unification and the tendency to copy urban general education institutions. Nonconstructivity of such attitude admitted L.N. Tolstoy, outstanding Russian author,

thinker and teacher. He stated that the best school in Paris would never be the best in a Russian village (22).

As a result, there is an unfavorable trend with the recruitment of school-leavers in agricultural colleges when among young people who study at these colleges are those who are not aware of a village life and their future profession. We observe a negative tendency when graduating students after completing their agricultural education don't want to work within their specialty. Moreover, they want to stay in towns and cities. This tendency is conditioned by social and cultural reality of rural life which differs considerably from urban. One of the distinctive features of social life in a village is that social interaction, upbringing and learning are in the same place.

Rural population revival should be the aim of primary importance, since only people who live in the rural environment possess knowledge (practical experience, context information, core values and etc.) that helps them to survive there. The process of acquiring this nonformalized knowledge necessary for existence in a rural community depends mainly on the family and school attitude. But if these two subjects of an educational system want to be successful in their training and upbringing mission they should rethink the importance of purposeful work in families and schools.

Both school and family should understand that educational process is better within the entire social and cultural environment and must not be limited by school walls (17). We can make a conclusion that the notion "village school" means not only its geographical position but also a unique social and cultural reality. The perception of an eared field or bee cap can evoke aesthetic emotional experience and understanding by a village teenager, i.e. the quality to perceive the world which is very important for person's successful learning and finding his feet.

Therefore, it is vital to establish modern centers of extended education for learners of municipal schools located in village settlements. A good idea to tackle global and regional challenges is to found an IT-school enabling knowledge acquisition about agriculture through information technologies and modern means of communication. An extra boost in this educational entity will receive:

- new approaches to occupational guidance for schoolchildren at Tomsk Agricultural Institute;
- the use of information technologies and modern means of communication in the educational process;
- vocation-related disciplines for reaching a desired level of proficiency.

At present the following profession-oriented courses are being developed by Tomsk Agricultural Institute for agrarian IT-school:

- 1) «Recreational agronomics»;
- 2) «Landscape design»;
- 3) «Vegetable growing»;
- 4) «Cattle-raising»;
- 5) «Bee keeping».

These courses include some projects allowing learners to experiment, formulate their own explanations about some facts, then develop a theory, confirm and advocate it, and simulate real situations (the development of agrarian technologies). This can be considered as characteristic

features of the course content. Thus, these agrarian based courses are important parts of "Technology". They allow students to put their biological knowledge into practice within school syllabus and acquire skills for transforming this knowledge into activity through combining theory and practice. Regulations of Federal State Education Standards (paragraphs 1.2.5.15. and 2.2.2.15) are the legislative framework for putting profession-oriented courses conducted at agrarian IT-school into educational practices of rural comprehensive schools (16, 9).

Further development of agrarian IT-school will ensure:

- initial profession-oriented training on the basis of village schools in Tomsk Region;
- the foundation of methodical councils for Biology and Information teachers;
- the development of learners' portfolios;
- the certification of graduating students attending profession-oriented classes.

All above mentioned enables the training of highly motivated school leavers for agrarian professional and educational institutions (2).

4 Conclusion

The development strategy of the establishing educational agro-industrial cluster aims at enhancing efficiency of the quality management system with focus on the State Standard requirements ISO 9001-2011 and recommendations of ENQA, EFQUEL international agencies. The quality management system includes a list of local acts and some tools for monitoring and quality control of the educational process and learning outcomes.

A special module called "Portfolio" will be introduced and then used as an automated system to assess training outcomes. This system is viewed as the inner quality management system and is developed within the project "Unified information management system". Besides, some local self-assessment systems of educational activities of agricultural institutes, colleges, agrarian comprehensive schools and agricultural enterprises are completed and adapted. Moreover, we plan to develop some guidelines for correct use of technologies for independent quality assessment of specialists' vocational qualifications at all stages of their theoretical and practical training. It is necessary to do it together with regional agrarian partners and foreign learning centers.

A training center of expertise will be established in the educational agro-industrial cluster. This center will coordinate actions of all educational institutions and employers involved in the development and expertise of training and policy documentation (19).

To train smart, intelligent and critically thinking specialists for agricultural needs of Tomsk Region within the educational agro-industrial cluster, Tomsk Agricultural Institute will function as headquarters for programming and comprehension of new learning outcomes. Learners will take part in comprehension of innovations adopted in different sectors of agricultural production. At a certain point they will become co-developers working together with scientists involved in the development of "breakthrough" programs in

different areas of agricultural science, engineering, biotechnology, management and etc. (3).

Tomsk Agricultural Institute has begun to master the function of a *competence aggregator*. It is responsible for arranging the probation period for university, college and agrarian IT school students at innovative plants. Tomsk Agricultural Institute is busy with the development of information banks where all urgent information on the activity of universities, laboratories, plants, training centers will be accumulated and all seasonal changes, the level of competitiveness and students' competence behavior will be recorded (24).

Tomsk State Agricultural University has decided to master a new function as a connector (conductor) aimed at improving learners' interest in innovative activity and ensuring targeted specialists' sustained and skillful use of innovative technologies and practices. It is necessary to create a flexible educational infrastructure that will be determined by individual syllabuses aimed at acquisition of key competences for creating innovations (leadership, investment, marketing, scientific research, innovative competences, competence intended to innovation implementation in the firm's operations and etc.). Tomsk State Agricultural University as a connector can choose economic, industrial, commercial, juridical educational institutions for college, university and IT school students (supplying them financially) where they can master key competences specified by their individual curriculum. This ensures conscious desire for innovations (24).

Thus, all institutions of Tomsk educational agro-cultural cluster carry out advanced training through mastering of certain meta-professional skills (universality, creativity, ability to teamwork, mobility and etc.) and some professionally important traits (communicativeness, purposefulness, responsibility, foresight and etc.) (25, 12). The use of the personality-centered approach allows graduating students of vocational institutions (a part of the educational agro-industrial cluster) to take an active part in projects aimed at the innovative development of agricultural production. Young specialists possess some relevant abilities and skills like self-evaluation, self-analysis, self-organization and lifelong self-education.

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